

A Robust Flare Planning Logic for Unmanned
Aerial Vehicle Applications

Aurora Flight Sciences Corporation

Technical Abstract

Aurora Flight Sciences proposes to develop a flare planning methodology that would provide aircraft guidance during this critical phase of flight. The algorithms that Aurora seeks to leverage the reachability problem in the fields of Optimal Control and Hybrid Systems, using Rapidly-Exploring Random Trees (RRTs) and Falsification theory. To this end, Aurora proposes the innovation of applying a suitable version of these algorithms to the design of a flare maneuver guidance and planning logic. The planner will be capable of dynamically producing a flare maneuver that does not violate the aircraft flight envelope and other stipulated constraints. The planner will meet the robustness requirements stipulated in the topic solicitation; namely, it will apply to both impeded and unimpeded aircraft, and it will operate under significant weather disturbances. The main technical challenge in developing the planning logic is extending and applying the chosen control algorithms to 6-DOF aircraft dynamics models under the required variety of operating conditions. The ultimate goal of the Phase 2 effort is to demonstrate Aurora's algorithms in an appropriately sophisticated Hardware-in-the-loop simulation of an impaired aircraft during a flare maneuver.

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Prognostic and Fault Tolerant Reconfiguration Strategies for
Aerospace Power Electronic Controllers and Electric Machines

Impact Technologies, LLC

Technical Abstract

Impact Technologies has proposed development of a real-time prognostic and fault accommodation system for power converters and electro-mechanical (EM) drive applications. The main goal for this program is development of techniques that enable fault tolerant control based on diagnostic features from the coil winding and power transistors. During Phase I, Impact achieved substantial and promising results in three main technical areas that provide opportunities to maturing tools that enable PHM and reconfiguration techniques. The technical areas include: Transistor Performance, Motor/Actuator Performance, and Fault Tolerant Reconfiguration. During Phase II, a significant effort will be employed to further develop the automated ringing feature extraction feature, leakage current sensing capabilities, and reconfiguration techniques for continued motor operation. These efforts will lead to development of prototype sensors for IGBT aging detection and current leakage detection as a health indicator of aging effects in power drives. Moreover, Impact will demonstrate reconfigurable control techniques for fault accommodations in EM applications. The long term implications of a successful completion of this program will provide reliability and health management tools for mission and safety critical applications for NASA, commercial, and military enterprises.

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